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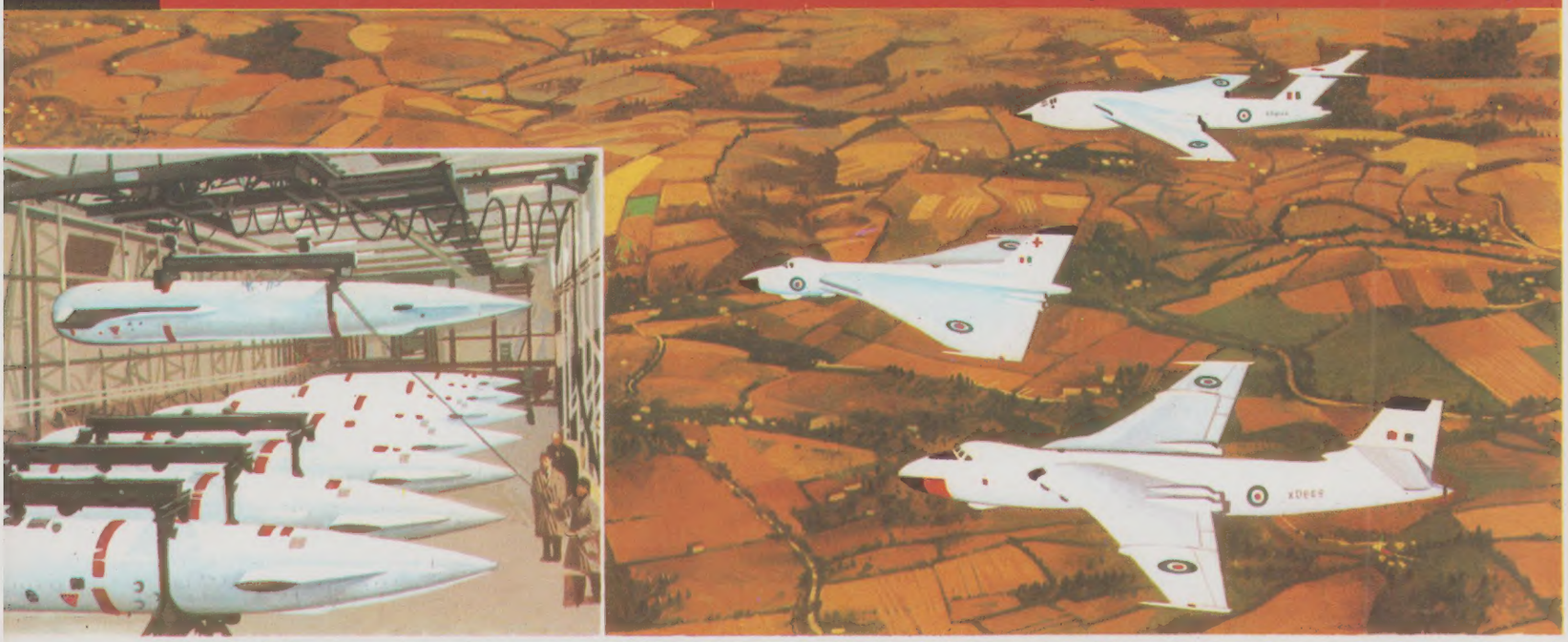
ROYAL AIR FORCE (part three)



Britain's V-Bombers – (from bottom to top) Valiant B Mk 1, *the Vulcan B Mk* 1, *and the Victor B Mk* 1. *Inset – Blue Steel, with which the Vulcan and Victor are being armed*

THE RAF is a fighting service – therefore it is equipped to operate in war rather than in peace. It is designed to meet two types of eventuality – a nuclear war or a limited war. The effects of a nuclear war (a war in which nuclear weapons are used) are too horrible to contemplate (see **Defence**). The second type of war we unfortunately contemplate too often. In it conventional (non-nuclear) weapons are used.

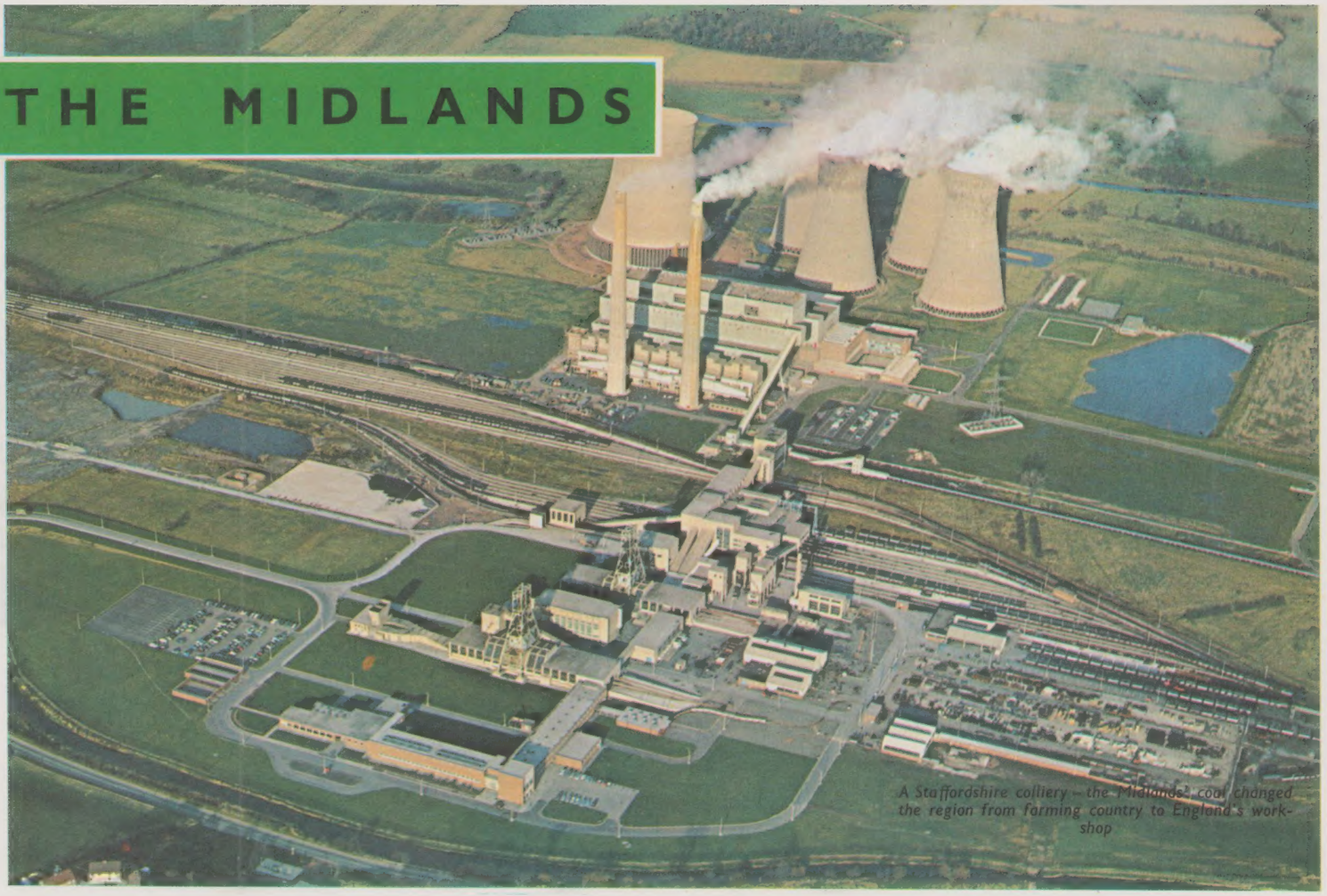
In the event of either of these types of war the RAF will have certain definite tasks to perform, and in this article we are going to examine these tasks. To carry out its work most effectively the RAF is broken down into a number of Commands: Bomber Command, Fighter Command, Coastal Command, Transport Command, Flying Training Command, Technical Training Command, Maintenance Command, Signals Command, and four overseas Commands which are miniature air forces in themselves. We must remember these Commands may have more than one task in the overall work of the RAF.

STRATEGIC NUCLEAR DETERRENT

An all-out war between any of the major powers could result in the destruction of life on this planet. This is because of the existence of nuclear weapons. So horrible is the prospect of such a war, it is argued, that nobody would be foolish enough to start one, and therefore the possession of nuclear weapons by a country *deters* an enemy from attacking it. Britain's nuclear deterrent is at present in a state of flux. In 1963 the government took the decision to base this deterrent on Polaris missiles fired from submarines. However, the first of these submarines will not come into operation until 1968. Until then the spearhead of Britain's deterrent will be as it is today – her V-Bomber force. The V-Bombers are the Vulcan, Victor, and Valiant – although the latter is now being increasingly used as an airborne tanker for refuelling planes in the air. Britain's other two V-Bombers are being equipped with the Blue Steel air-to-ground missile which can be fired at a target from many miles away. The striking force of one of these V-Bombers is greater than that of all the bombers in the last world war combined, and Bomber Command is said to have a destructive power equal to 20 million Lancasters. The Polaris submarine has obvious advantages over the bomber as it is less easily detected and the missile is much harder to stop than a bomber. But against this the bomber with a human pilot is a more intelligent weapon – it can be recalled or switched. Moreover, the British V-Bombers are also adapted for use with conventional weapons and for reconnaissance. The V force will probably stay in operation until the early 1970s when there will be advanced bombers like the supersonic, low-level TSR 2 in operation. At present Britain's V force is useful 'as the best deterrent we have', and also in its new role as part of NATO's striking force.

Previous page: (Bottom section) members of the RAF Bomber Command today and tomorrow – (bottom right) the Vulcan, spearhead of Britain's nuclear deterrent today; (bottom left) the TSR 2 – the new low-level, supersonic bomber which should be in service by 1970.
(Top section) Transport Command has become increasingly important in recent years – (top) the VC 10, one of the latest transports ordered by the RAF; (below it) Hastings C1 which since 1948 has been one of the RAF's most useful transports.

THE MIDLANDS



A Staffordshire colliery – the Midlands' coal changed the region from farming country to England's workshop

SINCE the 13th century the great expanse of land in the centre of England has been called the Midlands. This area is not easy to define precisely, but we will look at the district known as the Midland Triangle, which lies between the Welsh mountains in the west, the Cotswolds and Northampton uplands in the south and south-east, and the Fens in the east, and includes the tip of the Pennines in the north.

We have already looked at Northamptonshire (see page 1358), Birmingham (see page 1720), Leicestershire (see page 1791), and Derbyshire (see page 1854), and in this way have covered quite a large part of the Midlands. In this article we will look at the area as a whole, and at the activities that take place there.

Mining

One factor that has contributed greatly to the wealth of the Midlands is the presence of coal. For this region includes the North Derby and Nottinghamshire Coalfield, the North Staffordshire Coalfield, the South Staffordshire Coalfield, the Warwickshire Coalfield, and the Leicestershire Coalfield.

In the Black Country, as the mining and manufacturing area of South Staffordshire is called, coal was worked for local use as long ago as the 13th century. Iron worked in Staffordshire was smelted with charcoal-fired blast-furnaces, but in the 18th century smelting with coke became widespread and coal-mining became vitally important.

Map showing the Midland Triangle and its chief towns

Iron-ore reserves were poor, and by 1788 pig-iron was brought up the Severn and along the recently-built network of canals to be smelted in the Black Country. The building of the railways made it still easier to bring in ore and pig-iron, and towns and villages grew enormously. In 1862 there were 172 blast-furnaces in the Black Country.

In the 20th century the number of active blast-furnaces and mines in the Black Country has fallen. The demand for iron has given way to that for steel – produced in other districts – and some of the best coal seams have been exhausted. Today the Black Country is more concerned with manufacturing. But the other coalfields of the Midlands are still important, generally maintaining or increasing their output.

The chief iron-mining areas today are in the south-east, around Northampton, Kettering, and Corby. The latter, which was only a small village in the 1930s, is now a large steel town with a population of about 41,400, and is one of England's largest iron- and steel-producing centres.

Other substances mined in the Midlands include gypsum (the fibrous white material used in pottery and to make plaster of Paris), which is found in Nottinghamshire and Derbyshire, and granite for road surfaces, which is quarried in the neighbourhood of Charnwood Forest.

The West Midlands

The pattern of industry in the Midlands has been determined by natural resources. In the west it is dominated by the metal

trades and by pottery, originally based on the iron and clay found locally, and in the east by textiles, clothing, and leather manufacture, which have grown from mediaeval crafts based on wool and leather from the local farms.

Although the mining and smelting which gave the Black Country its name in the 19th century have now declined, manufactures developed there in association with the metal-smelting still prosper. Among the enormous variety of goods produced are bicycles, cars, arms, aero-engines, and machine tools.

The manufacturing towns of the West Midlands have merged together in the West Midland Conurbation. There are more than a million people at work there, and more than a quarter of them are employed in some field of metal manufacture and engineering. Birmingham, which has a population of 1,115,630, belongs to this conurbation although it does not stand on the coalfield and did not take part in the early ironworking of the West Midlands. Other leading members of the conurbation are Wolverhampton (150,280), Walsall (120,590), and West Bromwich (97,710).

Coventry (313,900) is a close neighbour of the West Midland Conurbation. By the late 14th century it was the fourth largest town in England, and its products included wool, soap, needles, and leather. But since it had local supplies of coal it was greatly changed by the Industrial Revolution, and its main products now include cycles, cars, electrical apparatus, and rayon. Coventry was very heavily bombed in the Second World War, and has now been rebuilt. Its wonderful new cathedral draws thousands of visitors each year.

Towns of the East Midlands

The principal towns of the East Midlands are Nottingham (315,050) and Leicester (270,390), both of which are industrial towns as well as marketing centres for the surrounding agricultural districts. The chief industry of both towns is the making of textiles and garments, particularly hosiery. The development of these industries, based on the wool produced locally, was greatly helped by the invention of machinery, much of which was developed locally. The engineering industries of both towns are partly associated with the making of machines for spinning, weaving, and knitting. Nottingham also produces bicycles, pharmaceutical products, and cigarettes and tobacco, while Leicester produces typewriters and footwear. Nottingham lace, for centuries made by hand, is now almost entirely made by machinery.

The church at Stratford-on-Avon, birthplace of Shakespeare

Farmland in Derbyshire – a startling contrast to the industrial towns

The main industries of Derby (131,630) are the making of locomotives and railway stock, car and aero-engines, and rayon and plastics. These are modern industries; the city's older industries include malting, hosiery-making, and china – Derby is the home of the famous Royal Crown Derby china.

Burton-on-Trent (50,590) is famous for its beer. Brewing has been concentrated here since the local water, which contains gypsum, is particularly good for this purpose, and the town has a considerable export trade.

The Potteries

No other industry in Britain of comparable size is as localised as the pottery industry at Stoke-on-Trent in the north of Staffordshire. The district known as the Potteries, which includes most of the county borough of Stoke-on-Trent and part of Newcastle-under-Lyme and Kidsgrove, is about 9 miles long and 3 or 4 miles across. It is the largest and most concentrated – and probably the most famous – area in the world for all kinds of pottery.

The pottery industry grew up here in the Middle Ages, and spread round the neighbourhood of Burslem. Two important factors were the local clay and the presence of long-flaming coal to fire the kilns in which the pottery was baked. The leading figure in the development of pottery in Staffordshire was Josiah Wedgwood, who has been called the father of English porcelain. He was born in 1730 into a family of Burslem potters and started work in the potteries at the age of 10. He bent his considerable intelligence to improving the quality of pottery, and in about 1768 he produced the fine cream-coloured porcelain known as 'Queen's Ware' since it was greatly admired by Queen Charlotte. In the 1770s he introduced into Staffordshire the use of Cornish china clay which greatly raised the quality of the local ware. He also did much to improve the design of porcelain, his taste following closely the neo-classical ideas of the architects of his day.

Wedgwood also took part in public affairs and was instrumental in getting the Grand Trunk Canal built which joined the Mersey, the Trent, and the Severn, and made it possible to bring china clay and flints from the south coast and Normandy to the Potteries. Other canals enabled lead for glazing to be brought from Derbyshire.

Towards the end of the 18th century a 'hybrid' porcelain, which contained a high proportion of white ash from burned ox bones, was introduced by Spode (one of the greatest Staffordshire potters) and others; this has remained the best-quality English table ware and is known as bone china.

Local fireclays are still used for making the crucibles in which the wares are placed during firing and for such things as salt-glazed pipes, tiles, and high-quality bricks.

The Potteries is a densely populated district, with congested towns built in narrow valleys. The workers' houses stand among the potteries themselves with their characteristic bottle-shaped kilns. There are numerous active coal-pits with great slag-heaps, and many marlholes (as the clay workings are called), some of which are still worked while others are now flooded. The real centre of the district is Hanley, though in 1910 the Potteries towns of Stoke, Burslem, Hanley, Longton, Fenton, and Tunstall were united to form the present county borough of Stoke-on-Trent, which has a population of 266,110.

The Black Country around Wolverhampton in 1866 (*from a contemporary print*)

Farming

We have shown that the Midlands have a great deal of industry, and indeed many people who live in other parts of Britain think of the area as being entirely industrialised. But they are, in fact, quite wrong. Large parts of the region are used for farming and it includes some of the best market-gardening country and orchards in England.

Worcestershire, in the west of the Midlands, is mainly rural except in the north-east, where it runs into the Black Country, and in Kidderminster, famous for its carpets. Almost every kind of crop is grown in south Worcestershire: grain, grass, vegetables including lettuces, asparagus, cabbages, cauliflowers, soft fruits such as strawberries, raspberries, and currants. Orchards are scattered throughout the county, particularly in the Vale of Evesham which is famous for its apples. The large industrial towns of the Midlands provide a convenient market for all these perishable goods.

The city of Worcester (67,320) is internationally renowned for the delicate porcelain made there. Gloves and Worcester sauce are also produced.

Leicestershire, in the East Midlands, is predominantly agricultural, except for Leicester and a few other towns; for centuries this county has been famous for its sheep (see page 1903). The chief crops are wheat and oats; two-thirds of the farmland is permanent grassland on which graze the many cattle and sheep. Milk production is important, and the famous Stilton cheese is made in the Vale of Belvoir. And throughout the Midlands, in the country surrounding the industrial towns, farming is carried on as it was before the face of the Midlands was changed with the coming of the Industrial Revolution.

Literary associations

The Midlands have produced several great literary figures, the most outstanding of whom is, obviously, Shakespeare (see page 2122). He was born in 1564 at Stratford-on-Avon in Warwickshire which has become the Shakespearean shrine for many millions of people from all over the world. The town of Stratford has had an annual Shakespeare festival since 1879, and among its attractions for visitors are Shakespeare's birthplace (now a museum), King Edward VI's grammar school where the poet was educated, the garden of the house (now demolished) called 'New Place' which he bought in 1597 and in which he died, and the parish church in which he and his wife, Anne Hathaway, are buried. The Shakespeare Memorial building, close by the river Avon, was founded in 1875 and rebuilt in 1932 after a fire. Its theatre company is internationally famous.

Shakespeare came from the Midlands; but he did not set his plays there. This is not true of three other notable literary figures who were born in the region – George Eliot, D. H. Lawrence, and Arnold Bennett.

George Eliot (whose real name was Mary Ann Evans) was born in Warwickshire in 1819, and went to school in Coventry. Although she travelled widely, she made the Midlands the setting of several of her novels, including *Adam Bede*. D. H. Lawrence came from Nottinghamshire; he was born in 1885, the fourth son of a coal-miner. Lawrence was educated in Nottingham, and although he wandered all over Europe and America many of his best novels are set in the county in which he was brought up. They describe in great detail the lives of the miners and farmers and the Nottinghamshire countryside.

At the same time that Lawrence was describing Nottinghamshire Arnold Bennett (1867–1931) was writing of the Potteries. He was born at Hanley and, like Lawrence, wrote many of his books against the familiar background of his childhood.

Another eminent writer, Hilaire Belloc, described the Midlands as 'sodden and unkind'. Go there, and see for yourselves how unfair this description is. For the Midlands include some of the most beautiful scenery in England, notably the Peak District and Dovedale.

PROTOZOA

IN a square foot of soil, from the surface downwards, there are likely to be living about 27,000 million bacteria, 5 to 6 million of the tiny worms called nematodes, about 2,000 insects, and 28 million protozoans. These last are minute animals, larger and less numerous than bacteria but more numerous than any other form of life, except, perhaps, algae (see page 600). They live wherever there is water: in the soil, in the sea, and in all fresh waters. They do more than inhabit the world around us, for we all have protozoans living inside us.

WHY THEY ARE CALLED PROTOZOANS

The Phylum Protozoa takes its name from the Greek words *protos*, first, and *zoon*, animal. Protozoans are the most primitive of all animals and appeared at a very early stage in the history of life on earth. The oldest protozoan fossils date from the Ordovician period, about 500 million years ago, but there is no doubt that protozoans of types not preserved as fossils existed much earlier.

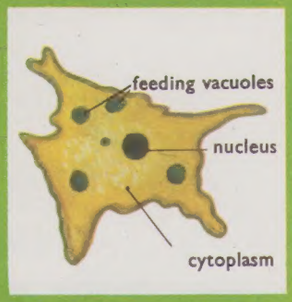
UNICELLULAR ANIMALS

The body of a protozoan, unlike that of any other animal, consists of just one cell, and for this reason is called 'unicellular'. The protozoan cell, like the cells of higher animals (see page 2326), is made up primarily of cytoplasm, within which lies a nucleus. However, since the unicellular body of a protozoan may have quite a complicated structure and carry out all the activities of a living creature, some authorities prefer to call protozoans 'non-cellular'.

ORGANELLES. In all protozoans there are special parts of the cell which carry out functions similar to those performed by the organs of higher animals. These are known as *organelles*, and are found both in the cytoplasm and on the surface of the cell. In the three pictures below, most of the various kinds of organelles found in the protozoans are illustrated.

Food vacuoles are open spaces in the cytoplasm which take up particles of food; digestive juices then flow into the vacuoles and dissolve the food.

Contractile vacuoles are open spaces in the cytoplasm which gradually expand, filling with water, and then quickly contract again, expelling the water from the cell. It is thought that this is a form of excretion.



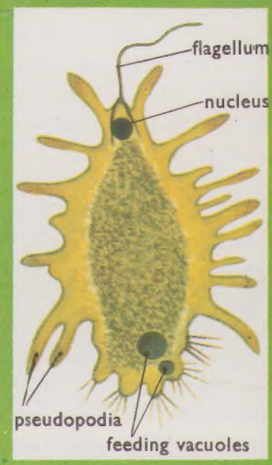
An amoeba: note the food vacuoles in the cytoplasm

Cilia are numerous fine hairs projecting from the bodies of certain protozoans. The animal swims by lashing the water with them.

A **flagellum** is a thread projecting from one end of a protozoan; it performs a wriggling motion which propels the animal through the water. There may be more than one flagellum, but they are never numerous like cilia.

Pseudopodia. Some kinds of protozoans, including the well-known amoeba, move by pushing out parts of the cytoplasm to form temporary limbs or pseudopodia. A pseudopodium can be protruded from any part of the body and is often withdrawn after a few minutes. These organelles are used for capturing food as well as for locomotion.

Paramecium (the cilia here are enlarged)



Mastigamoeba, with a flat flagellum and many pseudopodia

SOME WELL-KNOWN KINDS OF PROTOZOANS

Amoebae. The species of this group have soft bodies which are continually changing shape because of the pushing out of pseudopodia. Most of them live in fresh water or in the soil, but some are parasites which cause disease. *Entamoeba histolytica* lives in the human intestine and causes dysentery.

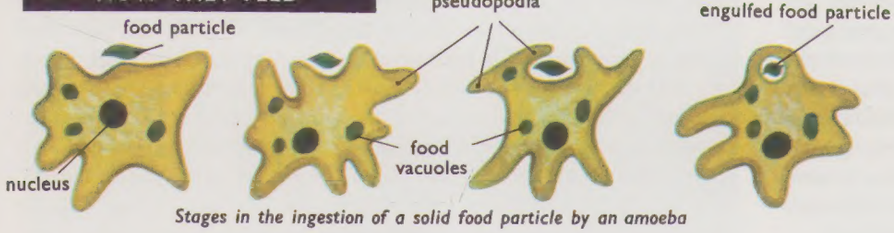
Radiolaria ② to ⑧ are minute protozoans found floating in the sea. They have delicate and intricate skeletons, usually made of silicon oxide or silica, but sometimes of strontium sulphate, as in *Acantharia* ⑧.

Heliozoa ① and ⑨ are mostly fresh-water forms with fine pointed pseudopodia projecting outwards like rays. Some have a silicious skeleton like the Radiolaria.

Foraminifera ⑪ are mainly marine protozoans and have shells or skeletons of calcium carbonate. The dead shells of the genus illustrated (*Globigerina*) form deposits over enormous areas of the ocean floor, which are called 'Globigerina ooze'. Foraminifera are often abundant as fossils.

Flagellata. These protozoans swim by means of one or several whip-like flagella. They are the most primitive protozoans, and it is difficult to say whether some, such as *Euglena*, are animals or plants, as they may or may not contain chlorophyll.

HOW THEY FEED

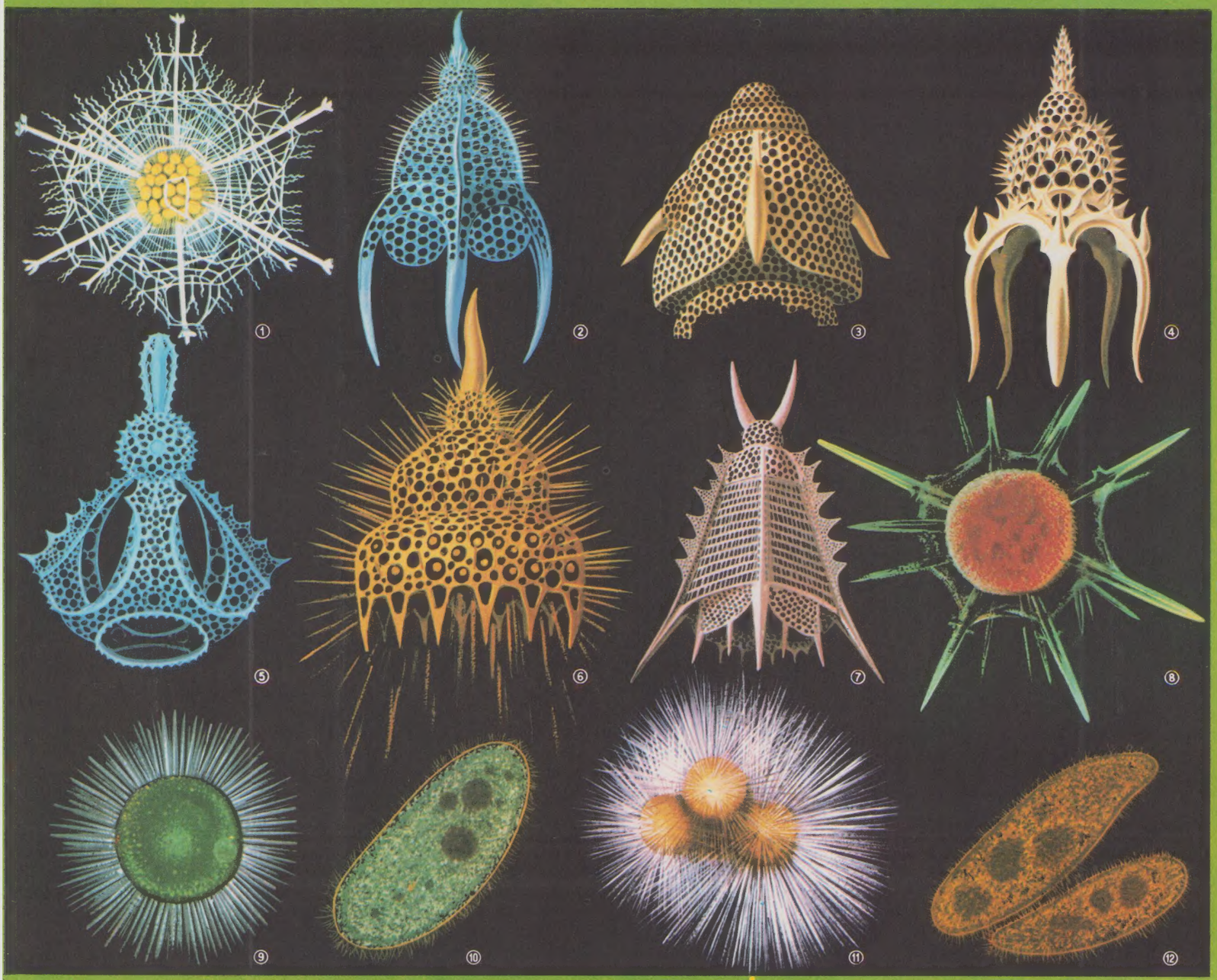


Stages in the ingestion of a solid food particle by an amoeba

More advanced protozoans, such as *Paramecium*, have a mouth and gullet lined with cilia, and small particles of food are swept into it and digested in food vacuoles inside the body. An amoeba has no mouth; when it encounters an edible particle two of its pseudopodia flow round it and join up beyond it, incorporating the particle into its body. Most flagellates feed by absorbing nutritive solutions from the water through the surface of their bodies.

REPRODUCTION

The most usual type of reproduction in protozoans is that known as 'binary fission', which is a simple dividing into two. First the nucleus divides and then the cytoplasm, so that there are two small individuals formed of the same substance as a previous larger one; these feed and grow and then divide in the same way. This kind of reproduction is seen in the amoeba and is typical of the flagellates. If the division is unequal, so that small individuals split off leaving the larger one more or less unchanged, the process is called budding or gemmation; this is typical of the more highly developed ciliates. Individual ciliates also come together in pairs and exchange parts of the

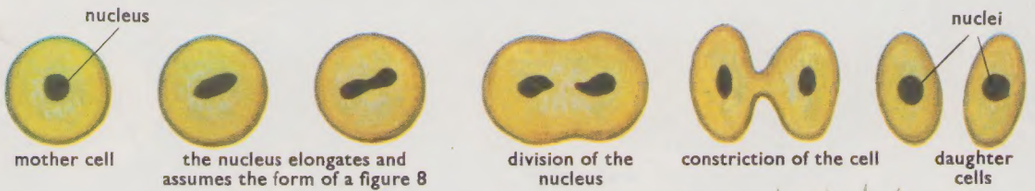


Sporozoa are parasitic protozoans that live in the body-fluids of higher animals, often causing disease. Some inhabit two or more different hosts. *Plasmodium*, the malarial parasite, alternates between man and mosquito. It is conveyed from one to the other when an infected mosquito bites a healthy person or a healthy mosquito bites an infected person.

Ciliata ⑩ and ⑫. This group includes the highest and most complex protozoans. They swim by means of their cilia. Although unicellular, they have two nuclei: a larger *meganucleus*, and a smaller *micronucleus*. *Paramecium* ⑫ is a typical example.

Note. Protozoans are only visible under a microscope; those above are much enlarged.

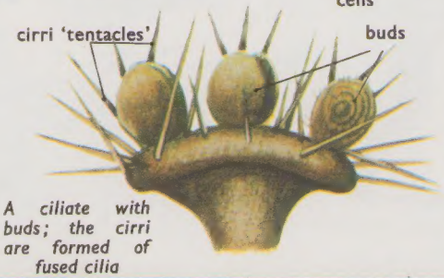
STAGES IN THE REPRODUCTION BY BINARY FISSION OF A PROTOZOAN



substance of their nuclei; this is regarded as a sort of primitive sexual reproduction.

HOW THEY BREATHE

Protozoa have no breathing organelles, but merely absorb oxygen from the water through their body walls. The cutaneous respiration of a frog is a similar process.

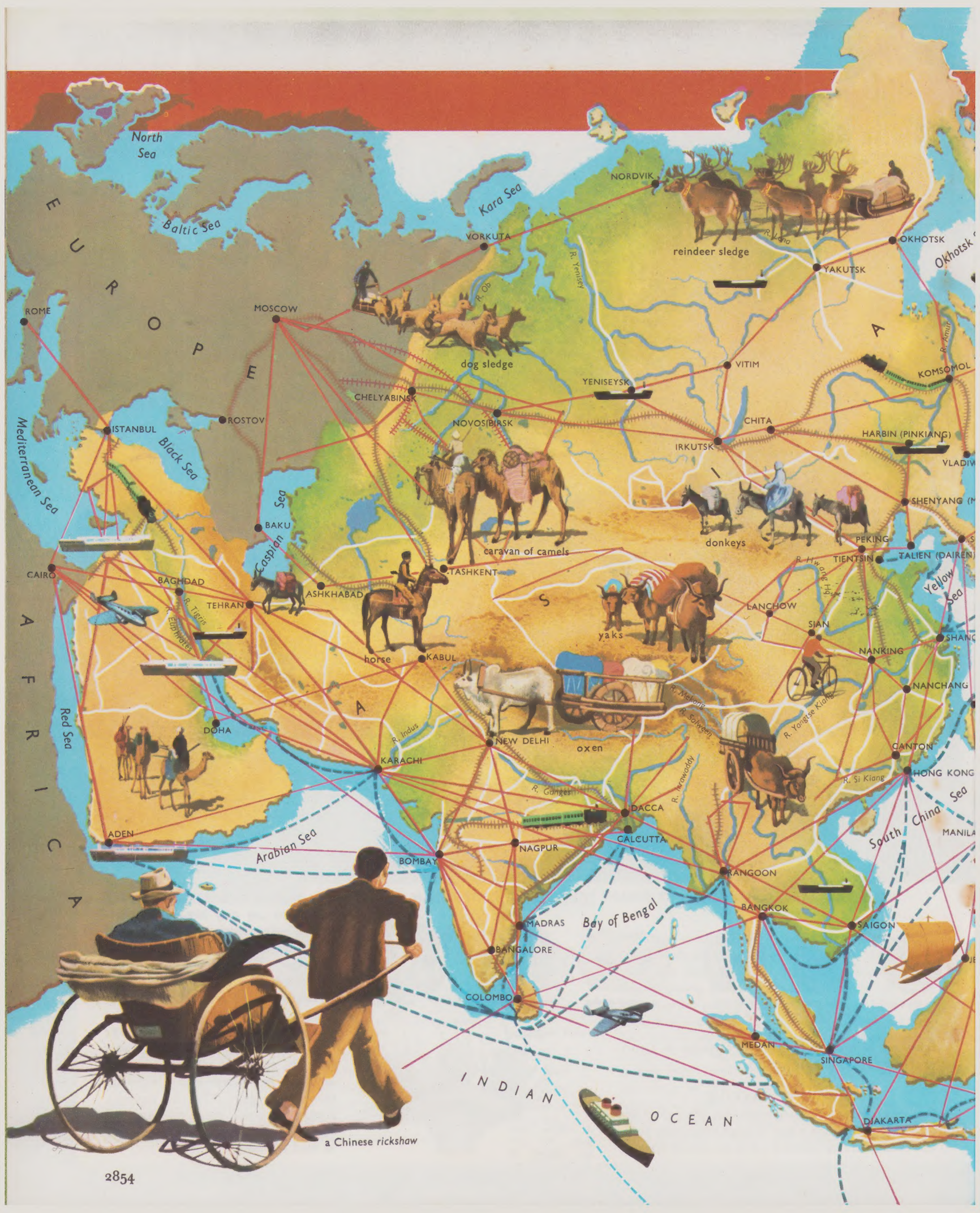


A ciliate with buds; the cirri are formed of fused cilia

WHERE THEY LIVE

Protozoans can only live in the presence of water. Most of them are found in the sea or in fresh waters, though they inhabit the soil where the particles are covered by a film of water.

Many species of protozoans are parasitic, and may cause diseases such as malaria or sleeping sickness (see page 426). Many others, however, are entirely harmless, and some of them are even beneficial. In the stomachs of ruminant animals (see page 1670), for example, protozoans break down cellulose, and by doing so enable the animal to digest its food efficiently.


North Sea
Baltic Sea
Kara Sea
EUROPE
ASIA
AFRICA
NORDVIK
VORKUTA
reindeer sledge
R. Lena
OKHOTSK
Okhotsk
YAKUTSK
R. Yenisey
R. Ob
MOSCOW
ROME
dog sledge
VITIM
R. Amur
KOMSOMOL
YENISEYSK
CHELYABINSK
ROSTOV
NOVOSIBIRSK
CHITA
HARBIN (PINKIANG)
IRKUTSK
VLADIV
ISTANBUL
Mediterranean Sea
Black Sea
Caspian Sea
BAKU
caravan of camels
donkeys
SHENYANG (M
PEKING
TIENTSIN
TALIEN (DAIREN)
CAIRO
BAGHDAD
TASHKENT
R. Hwang Ho
Yellow Sea
ASHKHABAD
TEHRAN
R. Tigris
R. Euphrates
LANCHOW
yaks
SIAN
SHANG
NANKING
horse
KABUL
R. Mekong
R. Salween
R. Yangtse Kiang
NANCHANG
Red Sea
DOHA
R. Indus
NEW DELHI
oxen
CANTON
KARACHI
HONG KONG
R. Si Kiang
South China Sea
R. Ganges
R. Irrawaddy
DACCA
MANILA
ADEN
Arabian Sea
CALCUTTA
NAGPUR
BOMBAY
RANGOON
BANGKOK
Bay of Bengal
MADRAS
SAIGON
BANGALORE
COLOMBO
MEDAN
SINGAPORE
INDIAN OCEAN
DJAKARTA
a Chinese rickshaw

ASIA: communications

ASIA is a vast continent. To fly across it from Cairo to Hong Kong, for example, would take you 16 hours in a fast modern jet. To sail round its coast from Aden to Yokohama would take 25 days, and if you wanted to travel on the Trans-Siberian express from Moscow to Vladivostok, you would have to spend between 9 and 10 days on the train. In this vast area there are many extreme variations: between thickly populated regions and almost uninhabited desert areas; between flat, fertile plains and high ranges of mountains; between snow-bound arctic lands and dense tropical jungles.

It is not surprising that such contrasts present enormous obstacles to communication, and have impeded the development of the continent as a whole. An area must have good communications to exploit its natural resources and market its raw materials and manufactured goods. It is significant that Japan, the most highly industrialised Asian country, also has the continent's best communications system.

Railways

The backbone of Japan's communications network is her railway system, which is one of the most efficient in the world. However, the rest of the continent has a very sparse coverage of railways, even in highly populated areas.

China, one of the most densely populated countries in the world, has such a shortage of trains that great warehouses have had to be built to store the back-log of freight.

As part of their colonial heritage, India, Ceylon, and Malaya have basic railway systems, but these are inadequate to serve the needs of their large populations.

Railways are playing an instrumental role in the development of less populated countries such as Manchuria, and Russia has invested heavily in lines linking the industrial European part of the country with the lesser developed soviets of Asia. The great linch-pin in the Russian rail system is, of course, the Trans-Siberian Railway which covers the 5,800 miles between Moscow and Vladivostok.

Sea and river communications

Water traffic along the coast of south-east Asia has always been important, and boats of traditional design, such as the *junk* and the *dhow*, are still in common use there.

Important international ports have also grown up, partly as a result of colonial influence, and partly as a result of the exploitation of oil and other natural resources. Japan is a major shipbuilding and fishing nation, and her merchant navy is the fifth largest in the world.

Asia has many great rivers which are vital lines of communication. The Tigris-Euphrates, the Indus, the Ganges, the Yangtse Kiang, the Hwang Ho, and the Irrawaddy all flow through densely populated areas and are of major importance for local trade and transport. The rivers of Asiatic Russia and Siberia are of limited value, however, as many of them are frozen for several months of the year and are subject to severe flooding in spring.

Road and air travel

There are comparatively few modern roads in Asia, except in India and Japan. This is a reflection both of the enormous physical obstacles to road building and the lack of capital in most Asian countries for investment in roads.

Great efforts have been made to extend roads into the arctic regions, but traditional forms of land transport, such as the camel, the horse, the yak, the mule, and the sledge, are still the most common in many parts.

These contrast strikingly with that modern means of communication – the aeroplane. Many parts of Asia are now linked with each other, and with the rest of the world, by jet airliner, and the aeroplane has also been of vital importance in exploration and mapping.

Next stop Novosibirsk, Siberia! A train on the 5,800*-mile Trans-Siberian Railway*

FRANCIS DRAKE

IN the bold, buccaneering days of Elizabeth I, when English seamen wrote a page in history which the passage of time has been unable to dim, the name of Sir Francis Drake towered above even the most illustrious of his contemporaries. His hand was at the helm in two titanic struggles: that of the sailor against the unknown in the Age of Discovery, when tiny wooden vessels set out into vast, uncharted seas, guided by maps plotted by guesswork; and that of a handful of Englishmen against the mighty forces of Philip II, lord of Spain, the New World, the Netherlands, and Portugal with Brazil and the East Indies.

No one knows when Drake was born. It could have been in 1540 or 1541. At that time it was France, not Spain, who was England's great enemy. And when he grew to manhood (not in his native village of Tavistock, but at Chatham, where his Protestant father was driven after the Catholic rising in the West in 1549) France was still the Englishman's first hate. Drake soon went to sea. He was apprenticed to the master of a small vessel, who bequeathed it to him, and he spent several humdrum years in the coasting trade. By 1565 his thirst for adventure had taken him to Guinea and the Spanish Main, and in 1567 he commanded the *Judith* on a voyage with his great kinsman, John Hawkins.

This ill-fated voyage marks a turning point not only in Drake's career but in history. For Philip II had taken a momentous decision – to defend his monopoly of the New World by force. Already, in 1565, a French community in Florida had been annihilated by Spanish troops. Now Hawkins's voyage, which started in October 1567 with six ships and 408 men, met a fate that the Tudor chronicles describe as 'troublesome' and we should call calamitous. On 23rd September 1568, near San Juan de Ulua, Hawkins's force was attacked by 13 Spanish warships. Four English ships were destroyed and most of the men perished. Only the *Minion*, with Hawkins, and the *Judith*, with Drake, made their escape.

Philip had thrown down the glove, and the English seamen, if not yet their Queen, were ready to pick it up. And so began an era of undeclared war, of 'private enterprise', in which English seamen preyed on Spanish shipping, excusing their piracy with tales of real or unfounded Spanish atrocities. Queen Elizabeth was, officially, not amused by such proceedings. But in private she prayed for the success of her gallant sailors; lent them an occasional vessel from the 25-ship Royal Navy; and pocketed her share of the booty when they returned.

After the 'troublesome' voyage with Hawkins Drake was soon back on the high seas. 1570 and 1571 found him journeying to the West Indies where he won several 'prizes' (or rather plundered a few Spanish ships), and, most important, perfected plans for a devastating thrust at the very source of Spanish wealth. His plan was to ambush, on land, the stream of treasure which flowed out of the silver mines of Peru. So in May 1572 Drake embarked from Plymouth for his first great independent voyage, with a fleet of two ships weighing together 95 tons and carrying a total crew of 73 men.

This tiny battle-fleet sailed out towards the Spanish Main, and on 29th July Drake and his men seized the town of Nombre de Dios (through which the Spanish silver passed) on the Isthmus of Panama. But in the fray Drake was wounded, and the object of the raid, the seizure of the treasure house, was a failure. After a six-month delay Drake laid another ambush near Panama on the other side of the Isthmus. But a premature movement by one of his men warned the Spaniards, and so another load of treasure eluded the English and found its way to Seville. It was the third attempt, once more at Nombre de Dios, which, in Drake's phrase, 'made' the voyage. This time they ambushed the treasure. There was too much booty to be carried off, but the Englishmen managed to take about £20,000 worth. Drake arrived back in Plymouth on Sunday 9th August 1573 with 30 survivors of his original crew. He docked at sermon time, and the news 'did so pass over all the church, and surpass their minds with delight and desire to see him, that very few or none remained with the preacher, all hastening to see the evidence of God's love and blessing towards our gracious Queen and country'.

Around the world in 1,018 days

Drake was back in England, but his mind was far away – stretching back to a February day when, on the Isthmus of Panama, he had climbed a tall tree and gazed with awe at the endless blue of the South Seas. On that day he had 'besought Almighty God in his goodness to give him life and leave to sail once in an English ship in that sea'. Yet he had to wait, for Queen Elizabeth – vacillating as ever – was trying to patch up England's grievances with Spain. Drake was warned to lie low unless he wanted his £20,000 to be investigated! It was only in 1577 that Drake obtained command of the expedition which was to earn him undying fame and to make him the first Englishman to sail round the world.

Drake left Plymouth on 13th December 1577 in command of five ships, himself aboard the 150-ton *Pelican*. What his exact instructions were nobody knows. Probably he was sent to sight the *terra australis*, a non-existent continent which 16th-century map makers inserted in the middle of the Pacific Ocean.

The expedition ran into difficulties from the start. One of the officers, Thomas Doughty, tried to stir up a mutiny. Drake promptly had him hanged. Two of his ships were destroyed by fire, and it was only the *Elizabeth* and the *Marigold* which accompanied Drake's ship into the Straits of Magellan. Here Drake renamed the *Pelican* the *Golden Hind*. No sooner were the ships through the straits than a violent and prolonged tempest arose. In seething, mountainous seas and icy winds the *Marigold* was sunk, and the *Elizabeth* turned for home. Drake was alone in the South Seas.

Having satisfied himself that Tierra del Fuego was an island (and not a part of *terra australis* as had been thought), he headed north along the Chilean coast. Then, for four months, the *Golden Hind* played havoc along the coast of Peru, plundering the ports and seizing Spanish treasure. Laden with gold, Drake moved north along the Californian coast. The natives crowded the beaches to gape at the strange white men, and, at what is now San Francisco, Drake decided to annexe the country. He called it 'New Albion'. Then he set sail west, and after three months reached the Moluccas, or Spice Islands. Concluding a trade treaty with one of the local sultans, he took on board six tons of cloves before setting out once more – this time for the Indian Ocean. On 10th January 1580, amid the treacherous reefs of the East Indies, the *Golden Hind* struck a shoal. For 20 hours she lay stranded and immobile. The ship's chaplain, Fletcher, preached that the disaster was God's retribution for the execution of Doughty. But Drake, lightening the ship by eight guns, some stores, and three tons of cloves, was not finished yet. The wind changed, and

Sir Francis Drake, the greatest of Elizabethan seamen, kneels before his Queen and presents her with treasure captured from the Spaniards

the ship, undamaged, slid off the shoal. Drake, having extended his authority to excommunicating Fletcher, set sail for the Cape and then for home. He arrived in Plymouth on 26th September 1580, three years after his departure. His first words were: 'Is the Queen alive and well?'

Drake was now a national hero. He was also a court favourite. The Queen spent hours listening to his tales, and on 4th April 1581 visited him on board his ship at Deptford. There, after a magnificent banquet, she knighted him.

Drake's knighthood was a significant slap in the face for the Spaniards. The next few years saw Queen Elizabeth throw in her lot completely with the men who had already been waging war on her Spanish enemy for so long. In August 1585 she signed a treaty to help the Protestant United Netherlands in their War of Independence with Catholic Spain. A few months earlier the Spaniards had laid before the Pope plans for an invasion of England.

The Dons sight Devon

War was now inevitable, though Queen Elizabeth still refused to recognise the obvious. In the autumn of 1585 Drake sailed, with 25 ships and only semi-official backing, to the Spanish Indies, where he plundered Hispaniola, Cartagena, and the coast of Florida. He returned in the summer of 1586 (bringing with him tobacco and potatoes) to learn that the Spaniards were preparing a mighty fleet which could only be intended for the invasion of England. So it was that in the spring of 1587 Drake, leading a fleet of 23 ships (six belonging to the Queen), set sail for Cadiz harbour, though he only just left in time to miss an order from the Queen recalling him. In a daring attack on the moored invasion fleet he 'singed the king of Spain's beard' to the extent of crippling over 30 ships. He then blockaded Lisbon and captured a Portuguese carrack valued at £114,000, twice the cost of the expedition. When he returned Elizabeth disavowed his action, though she pocketed £40,000 of the proceeds.

The Armada had been delayed but not cancelled. It was probably on 19th July 1588, when the Armada first came into view of the Lizard, that Drake was playing his famous game of bowls on Plymouth Hoe. In superb formation 130 vessels sailed majestically past the English coast on their way to ferry the Duke of Parma's invasion forces from the Netherlands to England. One of England's moments of destiny had arrived. To meet it she had a band of able and experienced seamen in fast, manœuvrable craft. Drake had expected to be given supreme command, but accepted without complaint his appointment as Vice-Admiral under Lord Howard of Effingham.

In the battle, Drake won fresh glory. Off Portland he captured the *Rosario* whose captain ransomed himself for £3,000, and he may have suggested the use of fireships, which, on the night of 28th–29th July, destroyed the enemy's formation. Soon the Spaniards were in full flight, having taken the fateful decision to return home round the Orkneys. On 31st July Drake wrote to Privy Councillor Walsingham: 'There was never anything pleased me better than the seeing the enemy flying with a southerly wind to the northward.'

The Armada was almost totally wrecked on its lengthy and terrible voyage. The following year Drake sailed with a huge fleet to harry the Spanish coast, but hunger and disease carried off thousands of his men and he returned home with little to show. For the next few years Drake busied himself with activities at home, representing Plymouth in Parliament and bringing a new water supply to the town. In August 1595 he set out on his last voyage. It was to the West Indies. Ill fortune dogged him from the start. Hawkins, his second-in-command, died off Puerto Rico in November, and Drake himself fell sick with dysentery. In January, at Puerto Bello, he died. His body was put into a leaden coffin and lowered into the deep. An anonymous poet, quoted in Prince's *Worthies of Devon*, wrote:

'The waves became his winding sheet; the waters were his tomb;
But for his fame, the ocean sea was not sufficient room.'

THE ELECTRIC BELL

FEW modern devices are more taken for granted than the electric bell. It is used as a door bell, a fire bell, and an ambulance bell – and anywhere where a loud noise is needed to attract attention. It is used so widely because it is a simple and reliable mechanism, which requires only an electric battery to make it work.

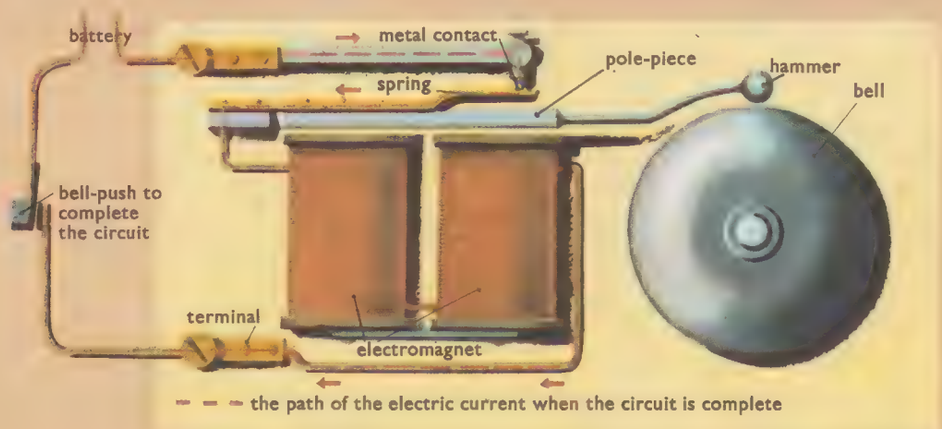
The electromagnet

The most important part of an electric bell is a small electromagnet. We have seen on page 2688 that when an electric current is passed through a coil of wire a magnetic field is formed around the coil. If the coil is wound around a piece of iron, the magnetic field inside it is substantially increased. When the electric current is switched on the magnetic field appears; when the current is switched off the magnetic field disappears. In an electric bell the magnetic field is used to attract another piece of iron to which is attached a hammer; and when the iron is attracted the hammer strikes a bell.

How an electric bell works

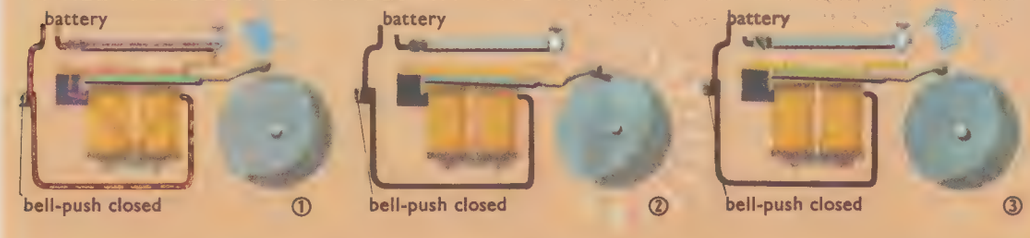
We see in the diagram below that the electromagnet in a bell is U-shaped. Let us suppose that we have not yet pressed the bell-push. Above the electromagnet is an iron plate or pole-piece, supported by a spring; when no current is flowing in the circuit, the pole-piece is a short distance

THE VARIOUS PARTS OF AN ELECTRIC BELL



away from the electromagnet. The free end of the spring holding the pole-piece touches a small metal contact, which is connected to one terminal of the battery. The second terminal is connected to the bell-push, from another part of which a wire goes to one end of the electromagnet. The wire from the other end of the electromagnet is connected to the pole-piece. The circuit is not complete until the bell-push is pressed; the current cannot flow and the bell will not work. When the bell-push is pressed and the circuit completed the current passes, and the bell rings. We will now examine the actual ringing of an electric bell.

THREE SUCCESSIVE STAGES IN THE RINGING OF AN ELECTRIC BELL



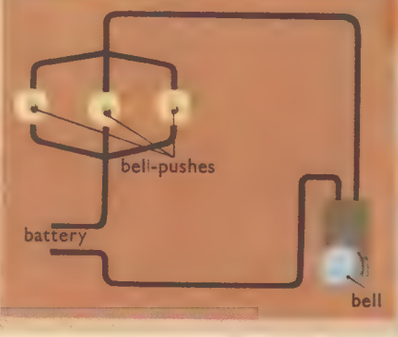
When the bell-push is pressed the circuit is completed ①; current flows through the electromagnet and the pole-piece is attracted to it. The pole-piece is pulled right down by the magnetic field of the electromagnet, and the hammer hits the bell ②, making it ring. But when the pole-piece moves down the spring no longer touches the metal contact. The electric circuit is no longer complete, and, as a result, the current cannot flow. The electromagnet loses its magnetism and can no longer attract the pole-piece.

③ The pole-piece is pulled back from the magnet by the spring. When it returns to its original position the electric circuit is again complete, since the spring is again touching the metal contact. The current can flow again, and the electromagnet once more attracts the pole-piece. The hammer hits the bell just as before.

Of course, all this happens far more quickly than can be described, and the circuit is completed and broken many times a second. In this way the pole-piece is first attracted and then released by the electromagnet, and its movement causes the hammer to give the bell a succession of sharp blows. The bell will keep ringing for as long as the bell-push is pressed. The number of hits per second depends on the distance between the pole-piece and the magnet, and the strength of the spring. Electric buzzers and horns work in the same way.

Special iron has to be used in the electromagnet because it is essential that it should lose all its magnetic attractive force as soon as the current is switched off, and impure iron would retain some of its magnetism.

Arrangement of three bell-pushes in parallel



Many bell-pushes, many bells

The diagram above shows a circuit with three bell-pushes and one bell. If any bell-push is pressed, the circuit is completed. Conversely, we can have a circuit with three or more bells and only one bell-push. When the bell-push is pressed all three bells will ring.

The louder the sound required, the stronger must be the blow from the hammer against the bell. This means that a more powerful electromagnet must be used.

THE WORLD AFTER THE 1939–1945 WAR

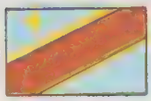
The map of the world is continually changing. When the United Nations was formed in 1945 *it had* 50 *members; in* 1964 *it had* 113. *There are more national states in the world now than there have ever been in the past. This poses new and difficult questions for the modern world*

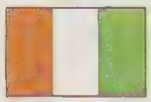
ON page 2833 we looked briefly at Europe after the Second World War. We saw that one of the most important factors in the post-war history of Europe was the so-called **Cold War** between Russia and America. Just as those countries sought allies in Europe, so they competed for the support of nations in other continents. All over the world, in places like Korea, Formosa, Vietnam, Laos, Indonesia, and the Middle East, the struggle has been going on. In several countries there have been civil wars between Communist and anti-Communist supporters, with Russia and America lending moral, or perhaps even military, aid. In Korea and Vietnam such conflicts have ended in the division of the countries into a Communist north and an anti-Communist south.

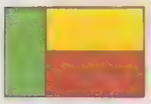
The Cold War conflict has been complicated by another of the great shaping factors of the post-war world – the upsurge of **nationalism.** At the outbreak of the Second World War millions of people in Asia and Africa were under the rule of European colonists. After the war they became increasingly restless. Many countries clamoured for, and got, independence. Some of these new nations seemed easy prey for Cold War propaganda, and both the Communist and American 'blocs' tried to win influence with the new governments. In certain instances they succeeded, but the vast majority of these nations remained neutral, uncommitted to either side. Indeed, the **uncommitted bloc** of newly independent states, with their large voting power in the United Nations (membership swelled from 50 to 113), has become a great new force in world politics.

The new governments of the emerging nations have great difficulties to face. It is estimated that three-quarters of the world's population is underfed, and **hunger** has emerged as one of the greatest post-war problems. Another difficulty for the new governments is maintaining peace and stability, particularly as **racialism,** whether hatred of black for white, white for black, or tribe for tribe, remains a major problem.

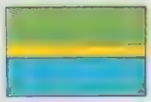
Thus, in the pattern of the modern world there are causes for both optimism and pessimism – hope that the new nations will solve their problems and emerge as forces for world peace; fear that hunger and incompetence will drive them under the influence of war-like nations. The world has probably reached a crucial turning point – as crucial in its way as the Renaissance and the Reformation. The key points in the momentous changes happening before our eyes, and recorded each day in our newspapers, are Africa and Asia. Nationalism in these continents has opened up a new era in world politics, and their role in the world they are helping to shape is of vital importance. At the same time, the extraordinary progress of science has opened up undreamed-of possibilities which may have revolutionary consequences for the future.


Congolese Republic

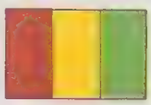

Ivory Coast


Dahomey

United Arab Republic

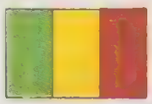

Gaboon

Ghana


Guinea

Libya

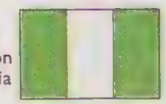
Madagascar


Mali

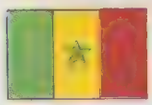
Morocco

Mauritania

Niger


Federation of Nigeria

Central Africa

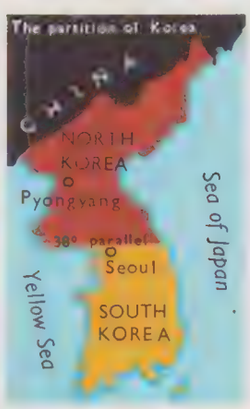

Senegal

The new Asia

When the Second World War began many nations, including Britain, France, the Netherlands, Portugal, and the United States, had colonies in the Far East. They had not all ruled well. Some had treated their colonies solely as a source of wealth to be exploited, while others had educated their subject peoples in gradual preparation for self-government. For many years the British government had claimed that it was developing its colonies for eventual independence, and hoped that such colonies would remain united within the British Commonwealth.

Before the war began there had been agitation for independence in India. When the war ended the agitation grew, and remarkable non-violent demonstrations took place under the religious leader Mahatma Gandhi. Eventually, in 1947, India was granted independence, and adopted a democratic constitution under her Prime Minister, Jawaharlal Nehru. But serious religious quarrels developed which resulted in the partition of India into two states – Pakistan (largely Muslim) and India (largely Hindu). Both nations joined the Commonwealth.

European control in the Far East had already been broken by the Japanese conquests of 1942. In 1948 Britain granted independence to Ceylon and Burma, and the following year the Dutch gave independence to Indonesia. In the early 1950s a civil war broke out in French Indo-China between Communist rebels in the north and government forces in the south. Eventually, in 1954, the French were forced to abandon Indo-China, and Cambodia, Laos, and Vietnam came into being. Vietnam became divided into two parts – the Republic in the south and the Communist 'Democratic Republic' in the north. In 1957 the Malay Federation became a sovereign state and joined the British Commonwealth. So, within the space of ten years, 568 million Asians had achieved independence.



Communist China has extended its influence over much of the Far East. Here Chinese soldiers parade in Shanghai. The date is 1950, one year after the Communists seized power in China

The Far East has been a focal point of the Cold War, largely because Communist China has endeavoured to influence the new nations emerging as her neighbours. China became Communist in 1949 when the Nationalist leader, Chiang Kai-shek, was defeated by the Communist leader, Mao Tse-tung, and forced off the mainland into Formosa. Almost at once the new Chinese rulers began extending their power and influence. In 1951 they overran Tibet, and there have been several border disputes between Indian and Chinese troops on the northern Indian border. In 1950 a major war broke out in Korea between a United Nations force (largely consisting of Americans) supporting the south Koreans and the Communist-dominated north Koreans. The Americans were partially successful in preventing the north Koreans overrunning the entire country, and in 1953 Korea was partitioned along the 38th parallel between the Communist north and the anti-Communist south. The rebels' successes were largely due to help not only from Russia but also from China. But the recent rift between Russia and China could result in a division in the Communist bloc, which might rob the Chinese of a great deal of influence in the Far East.

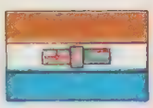
The Middle East

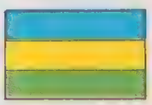
European countries, particularly Britain and France, have for a long time been interested in the Arab states of the Middle East. At the end of the Second World War they had powerful vested interests in the extensive Middle Eastern oilfields and the Suez Canal. But nationalists resented foreign interference. Iran seized British oilfields in 1951, and in 1952 a group of army officers, including Nasser, overthrew the Egyptian monarchy. In 1956 Nasser (by now Egypt's President) seized the Suez Canal. British and French troops landed to try to retake the Canal by force, but under pressure from the United Nations they were withdrawn.

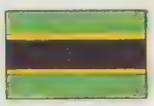
Nasser gained great prestige and became the leader of a pan-Arab movement which sought to create one state for all the Arabs. Egypt and Syria formed the United Arab Republic in 1958, but Syria broke away in 1961. Meanwhile rivalry had developed between Egypt and Iraq under her pro-Communist leader Kassim. But Kassim was assassinated in February 1963, and Iraq's government is now politically neutral. One great problem in the Middle East is Arab hostility to the state of Israel (established 1948).

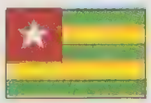
Sierra Leone

Somalia


South Africa


Sudan


Tanganyika


Togo

Tunisia

Volta or Voltaic Republic

Burma

The new Africa

In 1914 there were only three self-governing states in the whole of Africa: Ethiopia, Liberia, and South Africa. But in recent years there has been an unprecedented upsurge of nationalism, and today nearly all of Africa is either self-governing or moving towards independence.

Europeans did not settle in great numbers over most of Africa, and independence here was achieved peacefully. During the 1950s the colonial powers granted self-government to 43 per cent of Africa's population (97 million people), including great numbers of negroes in Ghana, Guinea, and the Sudan, and many Arab Muslims in Morocco and Tunisia. In 1960 a whole group of countries, including Nigeria, the Congo, and Madagascar, won their freedom.

But the story of post-war Africa has not been one of uninterrupted progress towards self-government. In South Africa, where there are $2\frac{1}{2}$ million whites, the government has made great efforts to cling to its power and privileges. It has enforced a policy of *apartheid* which separates the black and white communities and is part of a programme of separate development for the black and white peoples in its territory. In 1961 apartheid was condemned by the members of the British Commonwealth, whereupon South Africa seceded from it. There are several other parts of Africa, notably Kenya, the Rhodesias, and Algeria, where the whites have large settlements and have built up cities, farms, and a prosperity they are reluctant to lose. There has been bitter feeling and even bloodshed in the Rhodesias and Kenya, while in Algeria a terrible civil war died down only shortly before independence was achieved in 1962.

Another state is founded in Africa: the President of Togo proclaims independence in 1960

It is obvious that the old-style colonialism is dead. Some states, like Angola and Mozambique (Portuguese) and South-West Africa (Spanish), are still colonies, but it seems unlikely that they will remain so for long.

The new governments of Africa face enormous problems. The boundaries of their states are often matters of dispute, while tribal divisions sometimes disrupt the unity of the populations.

Like the Asian peoples, millions of Africans are undernourished and uneducated. The leaders themselves are often untrained and inexperienced. For example, when the Belgians left the Congo in 1961 the country nearly disintegrated through lack of administrators, and the United Nations' intervention came only just in time. With so many Africans uneducated, there is a tendency for some governments to become virtual dictatorships, for democracy needs educated and politically conscious populations.

But the growing importance of the new states of Africa and Asia in the United Nations, due to their numerical strength, means that they can bring their problems more and more before the eyes of the world. Given a few years of peace, Africa could play a vital role.

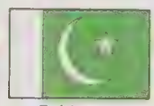
Scientific progress

The total number of the world's scientists today equals about 90 per cent of all the scientists who have ever lived. This reflects the enormous interest in modern science, and is also one reason for the unprecedented advances of recent years. Scientists are breaking new ground on all levels. They are analysing the very components of the atoms, and are studying stars millions upon millions of light-years away. They have succeeded in creating new elements unknown to nature (eleven of these by the early 1960s). They have heated matter to temperatures considerably higher than that on the surface of the sun, and cooled it to within a fraction of a degree of Absolute Zero (−273·15°C).

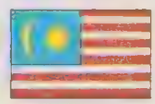
But the most spectacular advances of all have been those in space travel. On 4th October 1957 the world was startled to learn that the Russians had put an artificial satellite, *Sputnik I*, into space. On 12th April 1961 they once more stunned the world with the news that they had launched a man into space. The first American astronaut, John Glenn, orbited the earth three times on 20th February 1962. Since that date several journeys have been made in space, including one by the world's first spacewoman, Valentina Tereshkova. The race is now on for the next great step – to land a man on the moon.

The American 'Atlas' rocket, which took John Glenn's capsule into space in 1962

Syria



Pakistan



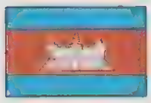
Federation of Malaysia

Lebanon

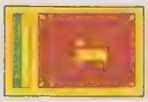
Kuwait

Israel

Iraq



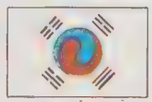
Cambodia



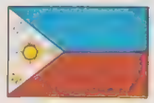
Ceylon

Cyprus

North Korea

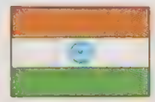


South Korea

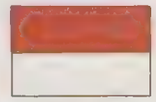


The Philippines

Jordan



India



Indonesia

Three dots on the map of Europe – Monaco, Andorra, Liechtenstein

IN 1959 an extraordinary conference took place at which four of Europe's smallest states were represented – Andorra, Monaco, Liechtenstein, and San Marino (see page 1700). These countries are very different in character but they do have a common problem – how to survive and prosper as independent states. The main theme discussed at the conference was tourism – the most important industry of these little states. In fact it is essential for all these states to attract tourists if they are to earn enough money to buy the goods they need from the rest of the world. And each year thousands of tourists flock across their frontiers to see what kinds of countries are represented by the dots which we see on the map of Europe, and to enjoy their natural beauty and unique ways of life.

The principality of Monaco

Monaco lies nine miles east of Nice on the Mediterranean coast of France, near the Italian border. The principality consists of a rocky peninsula, some 370 acres in area, which is entirely enclosed on the landward side by the mountainous French department *Alpes Maritimes*. The climate is very pleasant – temperatures range from 46°F in January to 74°F in July – mainly because the Alps keep off northern winds, such as the notorious *Mistral*, which blows along the Rhone valley. There is plentiful winter sunshine, and annual rainfall averages 33 inches. This means that palms, olives, and citrus fruits can be grown, and provides a strong incentive to visitors to come to Monaco, particularly in the winter months.

Monaco's geographical position gave it a measure of independence from the earliest times. Its status as a sovereign principality, however, dates from 1297 when it came into the possession of the Genoese Grimaldi family, which has held it ever since, except for the period 1793–1815 when it was annexed by France. It is indeed curious that it has managed to retain its independence for so long and that it has remained in the hands of one family. Monaco's status is guaranteed by a treaty with France which states that, should the Grimaldi dynasty become extinct, Monaco would become an autonomous state under French protection. Legislative power within the principality is vested jointly in the ruling prince and the National Council which has 18 members. The 20,400 Monegasques are exempted from military service and can move freely in and out of France, but they are forbidden access to the gambling tables of the famous Casino at Monte Carlo, which provides the principality's largest single source of revenue.

Apart from Monte Carlo, with its fine harbour and exotic gardens, the principality has two other towns – Monaco-Ville and La Condamine. Monaco-Ville, the old walled town, is dominated by the palace of the ruler, Prince Rainier III. It also contains the famous maritime

Monaco, the sunlit principality on the Mediterranean

DID YOU KNOW?

1. *The smallest countries in Europe are: the Vatican City State, 109 acres; the principality of Monaco, 370 acres; the republic of San Marino, 23 square miles; the principality of Liechtenstein, 62 square miles; and the co-principality of Andorra, 191 square miles.*
2. *Andorra has 33 people to the square mile, and Liechtenstein 297; while over 20,000 people live in just over half a square mile in Monaco.*

LIECHTENSTEIN

museum founded in 1910 by Prince Rainier's grandfather, Albert I. La Condamine, on the west bay, is the largest of the principality's three towns and the commercial centre of Monaco. Its manufactures include liqueurs, perfumes, and pottery.

The co-principality of Andorra

High in the eastern Pyrenees between Spain and France lies a group of valleys formed by streams which unite to become the Valira, a tributary of the river Segre, before it flows into Spain. This group of valleys, some 191 square miles in area, forms the co-principality of Andorra. No part of Andorra is less than 3,000 feet above sea-level, and it is surrounded by mountains from 6,000 to 10,000 feet high. This means that the country is very isolated, particularly in winter when the passes into Andorra are snow-bound, except in the south-west where the defile of the Valira provides an all-year route to Spain. Its isolation has contributed to the preservation of Andorra's unique, almost mediaeval, way of life. And its cool greenness in summer is one of the main attractions for tourists who come to visit the country.

Andorra's unique political status as a co-principality dates from 1278 when, after a long quarrel, the French Count of Foix and the Spanish Bishop of Urgel agreed to share the territory between them and rule as co-princes. This arrangement meant that Andorra was never too closely linked with either of its powerful neighbours and so managed to retain its independence. Today, though both France and Spain still exercise a measure of control, the country is mainly governed by the General Council of the Valleys with 24 members elected from among the local inhabitants. They choose a *First Syndic* as supreme executive. Most of the population (6,000) lives in six small villages, the largest of which, Andorra-la-Vella, is the capital of the country. The language spoken is Catalan, and most of the inhabitants are Roman Catholic.

The church of St Joan de Cassales in the lonely mountains of Andorra

Andorra is traditionally a pastoral country. In summer large herds of sheep and cattle are driven up to graze on the high pastures of the valleys, but in winter, because of the shortage of fodder and the severity of the climate, the animals have to be sent down to lower grazing grounds in France and Spain.

In recent years the lower slopes of the valleys have been used for growing tobacco. The leaf is processed locally, and large quantities are smuggled into France and Spain to escape the heavy customs duties. Products passing into Andorra, however, pay little duty, and the low price of goods there is an added attraction to the many tourists who come to visit this beautiful and unique country.

THE PRINCIPALITY OF LIECHTENSTEIN

The picture on the right tells us a great deal about the two main geographical regions of Liechtenstein – the flat flood-plain of the river Rhine, and the Alpine hills and mountains which surround it. Liechtenstein occupies an area of some 62 square miles between Switzerland and Austria.

In 1719 the barony of Schellenberg and the county of Vaduz, both held by the House of Liechtenstein, were united to form a principality with allegiance to the Holy Roman Empire. In 1866 the principality became independent. Until the end of the First World War Liechtenstein had close ties with Austria, but since then has been more closely associated with Switzerland. Because of its smallness Liechtenstein has escaped most of the upheavals of the last century, and has succeeded in retaining its independence. It has had no army since 1868, and a police force of 13 men keeps order throughout the country. Since 1921 Liechtenstein has been governed by a constitutional monarchy and a Legislative Assembly, elected by universal adult suffrage.

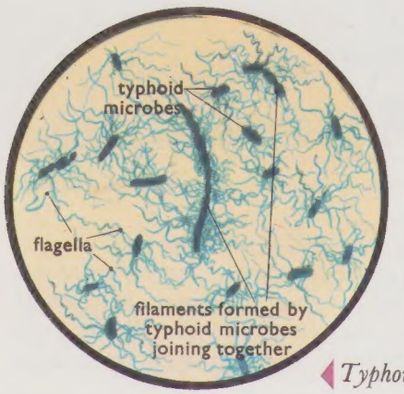
Liechtenstein, the fairy-tale country between the Rhine and the Alps

The 17,800 inhabitants of Liechtenstein, who are mainly German-speaking and Roman Catholic, are engaged in both agriculture and light industry. The main crops grown are wheat, vegetables, and grapes; and cattle, sheep, goats, and pigs are raised. A hydroelectric plant in the south of the country provides power for the manufacture of optical instruments, cotton goods, false teeth, pottery, and leather products. However, Liechtenstein's main industry is making postage stamps, and the sale of these brings in one-quarter of the national income. Vaduz, the capital, is the centre of the stamp industry, and philatelists from all over the world come to buy stamps there and visit its famous stamp museum.

TYPHOID FEVER

MARY MALLON was a cook, and as such she was a catastrophe. Not – as one might expect – because she was a bad cook, but because, through no fault of her own, she had once had an attack of typhoid fever. Though it appeared that Mary had made a complete recovery from her serious illness, the typhoid germs continued to grow in her body, and for the rest of her life she spread a few of these germs about her wherever she went. Mary was, in fact, a *typhoid carrier*.

Between 1901, when Mary had her attack of typhoid, and 1907 she held posts in four different households, and in each she infected some of the family, sometimes with fatal consequences. For a time she was forcibly kept in a hospital where she could do less harm, but unfortunately she escaped and secured the post of cook in another hospital, this time in New York. There she cooked for the doctors and nurses, and once again her culinary efforts resulted in an outbreak of typhoid. It is now quite impossible to be certain of the exact number of cases of typhoid for which Mary was responsible, but it was probably about 2,000. It is not surprising that Mary is the 'heroine' of one of the best-known of all medical anecdotes, and that in medical history she has been immortalised as 'Typhoid Mary'.



Typhoid microbes under a microscope (magnified 2,000 times)

The cause and transmission of typhoid

An attack of typhoid fever is the result of an infection with a tiny microbe, which is now generally known as *Eberthella typhi*. The name is derived from that of the famous German physician Carl Joseph Eberth, who isolated the microbe in 1880 from the abdominal glands of patients who had died of typhoid. The microbe is about 1/5,000th of an inch long and about 1/50,000th of an inch wide. In spite of its small size, however, it has a large number of hair-like *flagella* with which it swims.

A patient with typhoid fever has large numbers of typhoid microbes in the masses of lymphoid tissue in the wall of his intestines. From here many of the microbes enter the contents of his intestines and are subsequently discharged in the faeces. By this means typhoid microbes find their way into sewage, and should any of this infected sewage contaminate a water supply, an outbreak of typhoid fever will follow almost inevitably.

Sometimes typhoid germs are carried directly from the faeces of a typhoid victim or a typhoid carrier by unwashed hands or by flies.

The spots on a typhoid victim's trunk

The disease

An uncomplicated attack of typhoid fever lasts about four weeks. The disease is a serious one, and a typhoid patient is often very ill.

People with typhoid almost always have a high temperature and a headache. Abdominal pain is common, and this is accompanied by diarrhoea or constipation. The characteristic rose-coloured rash appears between the seventh and tenth day of the illness.

Drowsiness and weakness characterise the second and third weeks of the illness. But by the fourth week, in an uncomplicated case of typhoid, the patient begins to improve and is convalescent soon afterwards.

Treatment

Patients with typhoid fever need expert nursing – at one time this was almost the only aid to recovery which was available. Since the discovery of the drug chloromycetin, however, the situation has changed. Physicians now have an antibiotic which is effective against the typhoid microbe and which aids the recovery of their patients. Even so, the complete answer to typhoid has yet to be found. Though useful, chloromycetin has occasionally unpleasant side-effects, and this means that it has to be used with great discretion.

Prevention

In highly civilised countries typhoid fever is a rare disease. The standards of hygiene and sewage disposal are such that there are few opportunities for typhoid microbes to find their way either into the water supply or into food. Only in the unusual event of an infected person living in a town where both the sewage disposal and water supply systems are faulty is there a serious likelihood of a large water-borne epidemic.

In hot, fly-ridden countries, and in underdeveloped areas where a river may serve both as a water supply and as a sewer the risks are far greater. In these circumstances protection is needed, and this is usually provided by *vaccination* (see page 168).

Typhoid vaccine consists of killed typhoid microbes suspended in preservative. When injected, the vaccine causes the vaccinated person's tissues to make *antibody*, which provides some protection against typhoid fever. Paratyphoid vaccines are usually given at the same time.

The paratyphoid fevers

The paratyphoid fevers, of which three varieties are known, are so much like typhoid that it is difficult to distinguish them without the aid of an expert bacteriologist. The course of the illness in the paratyphoid fevers, however, is usually less severe than the course of typhoid fever. Each is caused by a different type of microbe, though all are closely related to *Eberthella typhi*.

Outbreaks of paratyphoid fever are quite common in Britain. Their cause can frequently be traced to infected foodstuffs.

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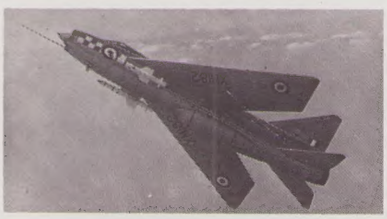
AIR DEFENCE

Bloodhound – the RAF's ground-to-air missile

The Javelin – the all-weather fighter which will eventually be replaced by an all-weather version of the Lightning



A Lightning equipped with Firestreak air-to-air missiles

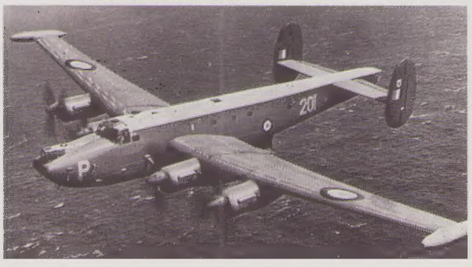
Lightnings – mainstay of the RAF's Fighter Command

The general tasks of Fighter Command are the air defence of Britain and co-operation with other NATO forces. In particular, Fighter Command acts in support of Britain's ultimate defence – its nuclear deterrent. Its Mach 2 Lightnings and subsonic Javelin all-weather fighters protect V-Bomber bases from attack. The Lightning Mk 2 squadrons are being armed with the Firestreak air-to-air missile. The improved and faster Lightning Mk 3 will be equipped with the more advanced Red Top missile – which, unlike the Firestreak, is able to fire at a target from any direction. The Bloodhound ground-to-air missiles also protect Britain's V-Bomber bases. Additional support is given to the V-Bombers by the Ballistic Missile Early Warning System at Fylingdales, Yorkshire, whose radar gives warning of the approach of an enemy.

ANTI-SUBMARINE STRIKE

The main enemy of the Coastal Command in time of war is the submarine, and its main weapon in this fight is the Shackleton MR 3. The Shackleton is a highly efficient piston-engined maritime-reconnaissance aircraft, equipped with radar, and capable of flying for stretches of up to 24 hours. As a special aid to the detection of submarines it can maintain a slow speed at 1,000 feet above the water.

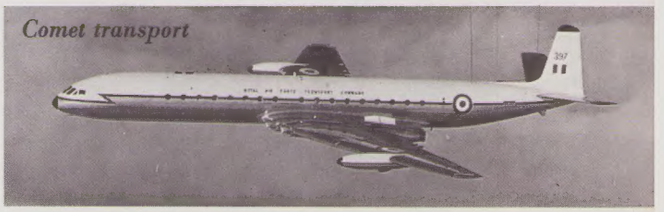
Shackleton MR 3



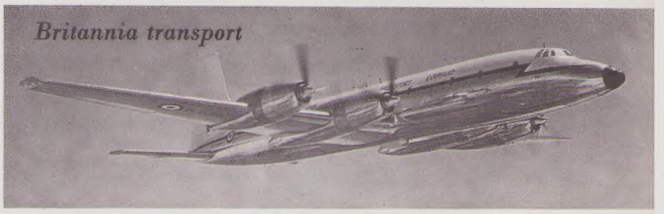
STRATEGIC AIR-LIFT

Once Transport Command was the 'Cinderella' of the RAF. Now it plays a vital role in Britain's military strategy. The strategic use of Transport Command is to carry British troops and equipment all over the world at the shortest notice and the maximum speed. Troops may have to be moved quickly to Cyprus, Borneo, or any other trouble spot throughout the Commonwealth. The planes of Transport Command include the Comet, Britannia, and Argosy. Moreover, the Belfast strategic freighter and the VC 10 are now on order. Transport Command also operates more closely with the Army on the battlefields (see 'Army Support').

Comet transport



Britannia transport



Belfast strategic freighter

No. 179 Volume 15

Knowledge

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ARMY SUPPORT

Belvedere helicopter

Argosy troop and supply carrier

The RAF often supports the Army. Troops and supplies can be moved quickly by Belvedere or Whirlwind helicopters or Argosy transports. Hunter and Canberra fighter-bombers can support the ground forces by rocket or bombing attacks.

Hunter GA 9

OFFICER RANKS IN THE RAF

Marshal of the RAF
Air Chief Marshal
Air Marshal
Air Vice-Marshal
Air Commodore
Air Commandant (WRAF)
Group Captain
Group Officer (WRAF)
Wing Commander
Wing Officer (WRAF)
Squadron Leader
Squadron Officer (WRAF)
Flight Lieutenant
Flight Officer (WRAF)
Flying Officer
Pilot Officer

The commanding officer of the RAF is called the Chief of the Air Staff. He can be an Air Chief Marshal or Marshal of the RAF. Commands can be under Air Chief Marshals, Air Marshals, or Air Vice-Marshals; a group or sector under an Air Vice-Marshal; a college or school under an Air Commodore; a RAF station under a Group Captain or sometimes a Wing Commander; a squadron under a Wing Commander or Squadron Leader; an air crew under a Flight Lieutenant, Flying Officer, or Pilot Officer.

A CAREER IN THE RAF

There are career information centres throughout the country, or you can write for further information to: Ministry of Defence (Air), Adastral House, London WC1.

Crest of the RAF

The strategic role of the RAF would be impossible were it not for the activities of the less spectacular Commands. Flying Training Command trains pilots and other air crew. Technical Training Command trains ground staff. Maintenance Command sees that all items of equipment are delivered as required, and Signals Command looks after the RAF's vast network of communications and radar. Members of the Women's Royal Air Force (WRAF) are now working in every branch of the service – there are even women pilots, though not of combat planes.

The RAF comes under the Secretary of State for Defence. Below him is the Minister of Defence for the Royal Air Force. In 1964 the Air Ministry was incorporated with the Ministry of Defence. The Ministry – which includes both service officers and civil servants – is responsible for the administration of the RAF. The actual operational command is, of course, in the hands of the RAF's officers.

PHOTOGRAPHIC RECONNAISSANCE

The object of photographic reconnaissance is to find out as much as possible about the enemy's movements, troop positions, bases, and so on. Specially equipped Canberras and Valiants are used in this work.

Canberra B (I) Mk 8

STRATEGIC STRIKE

Attached to the overseas Commands of the RAF are squadrons of Hunter, Javelin, and Canberra strike aircraft. These may act either in co-operation with the Army or independently in attacking communications, airfields, bases, and so on. A revolutionary strike aircraft soon to come into operation is the vertical-take-off P1154, whose prototype is the P1127.

SOME KNOWN AIRCRAFT PERFORMANCES

Vulcan, Victor, Valiant: operate close to the speed of sound at heights of over 50,000 feet. *Javelin:* speed subsonic; operates above 50,000 feet. *Lightning:* operates at Mach 2 above 60,000 feet. *Canberra:* can fly at 541 mph at 48,000 feet; range 3,630 miles. *Hunter:* maximum speed at sea-level 702·5 mph; can operate at 50,000 feet. *Argosy:* speed 265 mph; range 1,100 miles with 20,000-lb payload. *Comet:* speed 525 mph; range 2,590 miles. *Britannia:* speed 355 mph; range 2,825 miles. *Belvedere:* speed 138 mph; range 75 miles. *Shackleton MR 3:* speed 300 mph; range 3,660 miles.

Past and future: (above) Britain's first jet-fighter, the Meteor; (below) the vertical-take-off P1127